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Onishi

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(54) **POWER SUPPLY APPARATUS, IMAGE FORMING APPARATUS, POWER SUPPLY METHOD, AND PROGRAM**

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H04N 1/00 (2006.01)

(52) **U.S. Cl.**
CPC ***H04N 1/00901*** (2013.01); ***H04N 1/00204*** (2013.01); ***H04N 1/00307*** (2013.01); ***H04N 1/00411*** (2013.01); ***H04N 1/00413*** (2013.01); *H04N 1/00347* (2013.01); *H04N 2201/001* (2013.01); *H04N 2201/006* (2013.01); *H04N 2201/0055* (2013.01); *H04N 2201/0084* (2013.01); *H04N 2201/0094* (2013.01)

(58) **Field of Classification Search**
USPC 358/1.14
See application file for complete search history.

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(57) **ABSTRACT**

A power supply apparatus includes a display control unit configured to display external devices allowed to receive power from the power supply apparatus, an input reception unit configured to receive, from a user, an input for selecting an external device as a power supply target from among the displayed external devices, and a power supply target device identification unit configured to identify the selected external device as a power supply target.

9 Claims, 17 Drawing Sheets

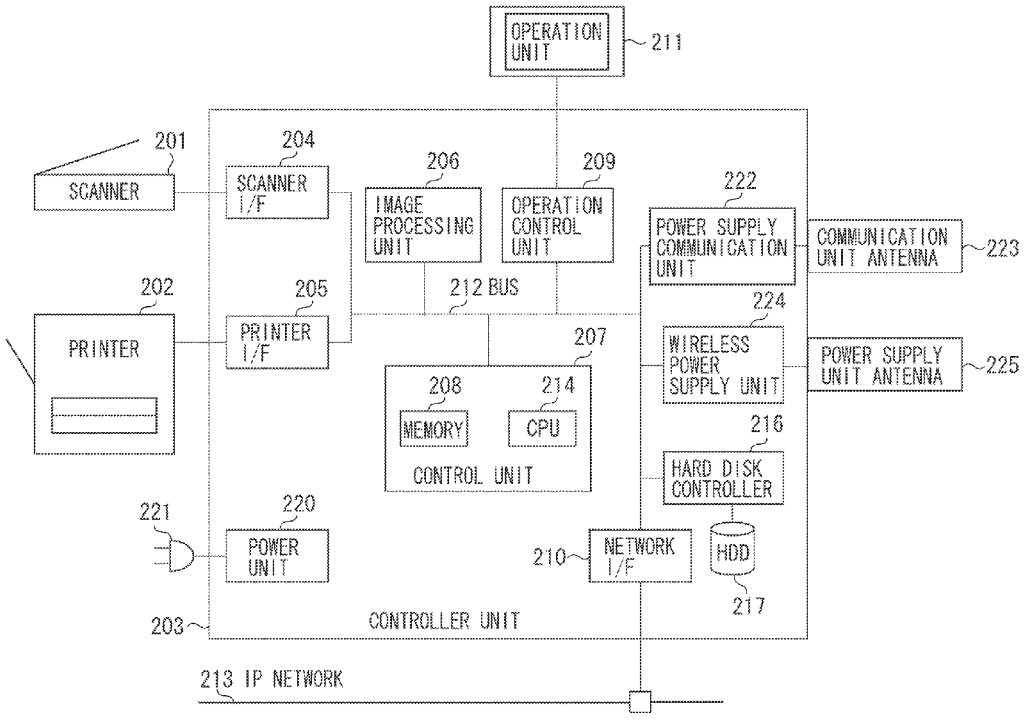
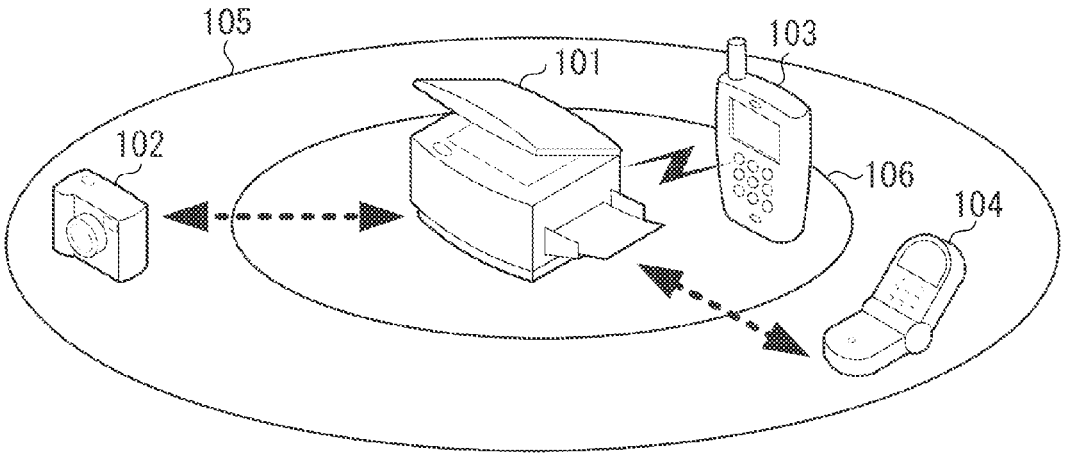


FIG. 1



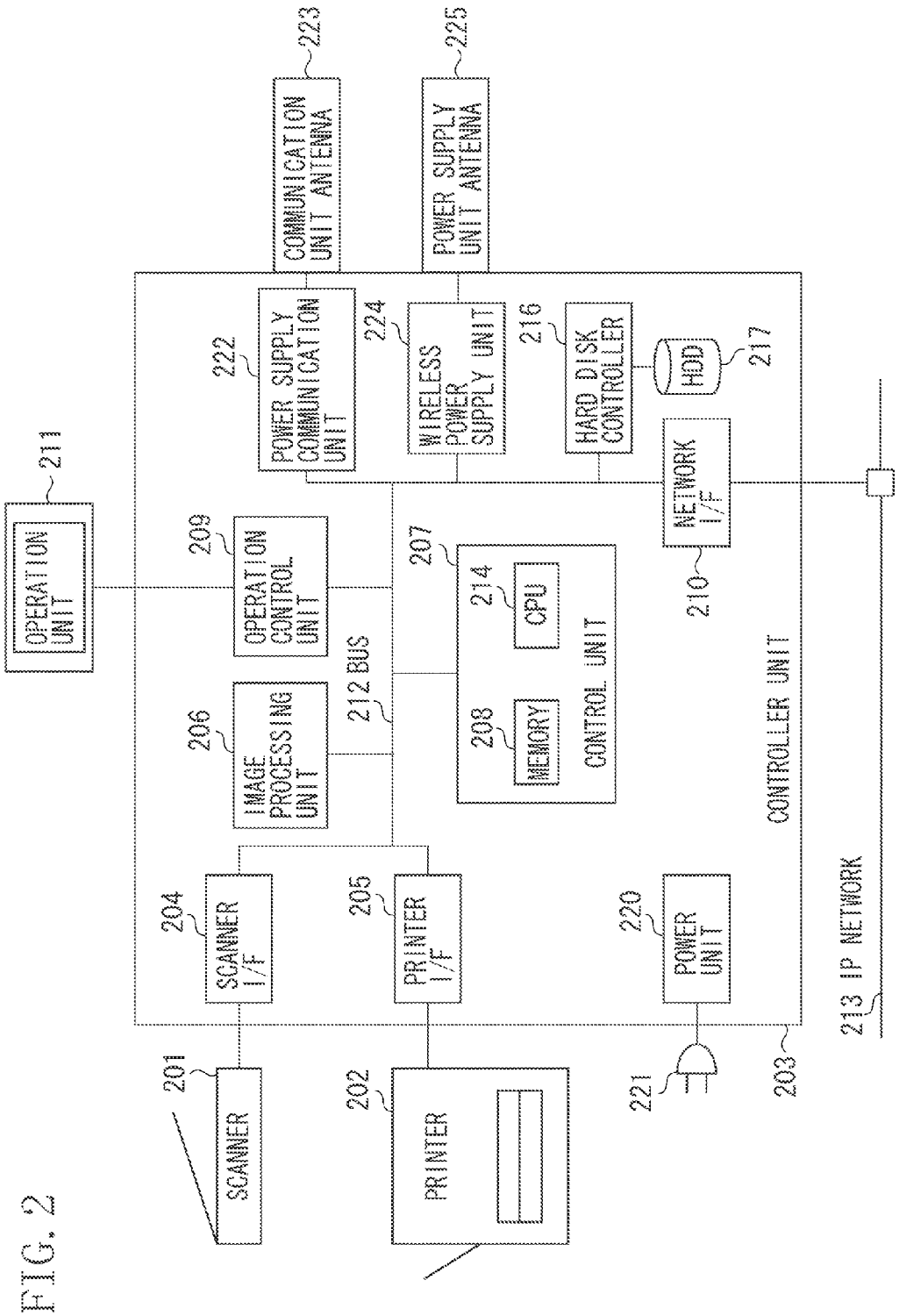

223
COMMUNICATION UNIT ANTENNA
225
POWER SUPPLY UNIT ANTENNA
222
POWER SUPPLY COMMUNICATION UNIT
224
WIRELESS POWER SUPPLY UNIT
216
HARD DISK CONTROLLER
217
HDD
211
OPERATION UNIT
209
OPERATION CONTROL UNIT
207
214
CPU
208
MEMORY
CONTROL UNIT
210
NETWORK I/F
206
IMAGE PROCESSING UNIT
212 BUS
CONTROLLER UNIT
204
SCANNER I/F
205
PRINTER I/F
220
POWER UNIT
213 IP NETWORK
201
SCANNER
202
PRINTER
221
203

FIG. 2

FIG. 3

DEVICE ID	POWER SUPPLY FREQUENCY (KHz)	REQUIRED POWER (mW/min)	BATTERY CHARGING STATUS (%)	POWER SUPPLY FLAG	AREA	PRIORITY FLAG	COOPERATION FLAG
ID01	200	500	50	STOP	OUT		
ID02	220	200	40	SUPPLY	IN	PRIORITY	
ID03	300	100	30	SUPPLY	IN		
ID04	320	800	80	SUPPLY	IN		PRINT
ID05	180	200	90	SUPPLY	IN		

FIG. 4

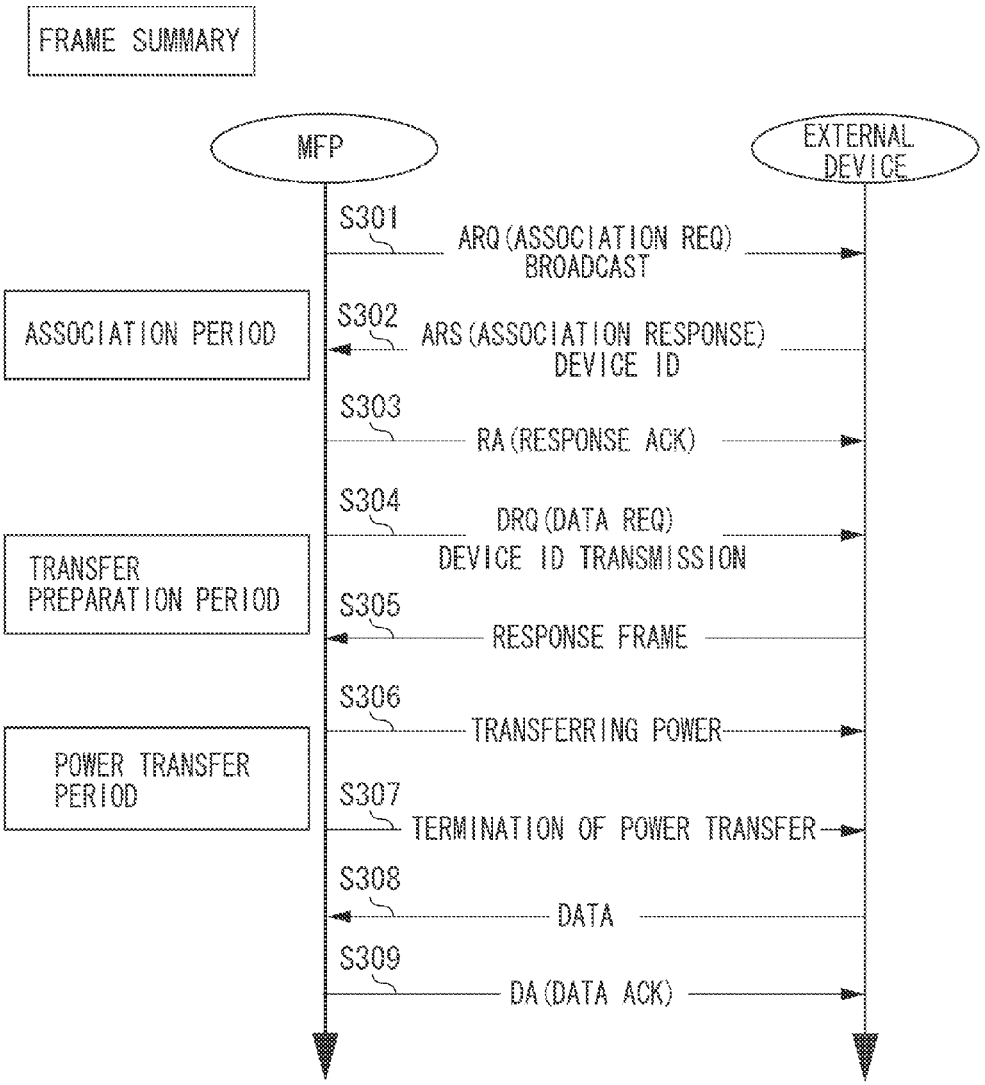

FRAME SUMMARY
MFP
EXTERNAL DEVICE
S301
ARQ(ASSOCIATION REQ)
BROADCAST
ASSOCIATION PERIOD
S302
ARS(ASSOCIATION RESPONSE)
DEVICE ID
S303
RA(RESPONSE ACK)
S304
DRQ(DATA REQ)
DEVICE ID TRANSMISSION
TRANSFER PREPARATION PERIOD
S305
RESPONSE FRAME
S306
TRANSFERRING POWER
POWER TRANSFER PERIOD
S307
TERMINATION OF POWER TRANSFER
S308
DATA
S309
DA(DATA ACK)

FIG. 5

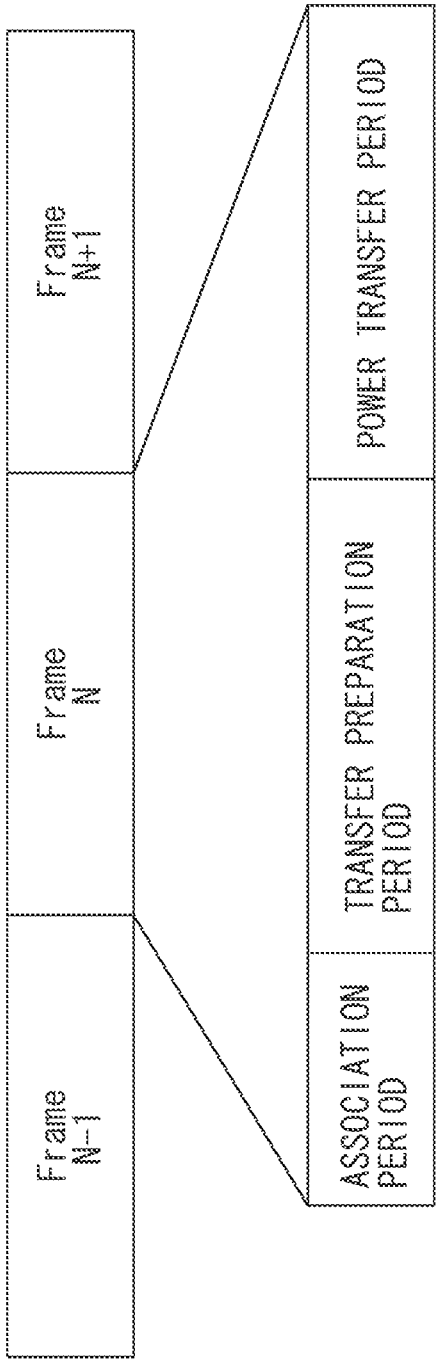

Frame N-1
Frame N
Frame N+1
ASSOCIATION PERIOD
TRANSFER PREPARATION PERIOD
POWER TRANSFER PERIOD

FIG. 6

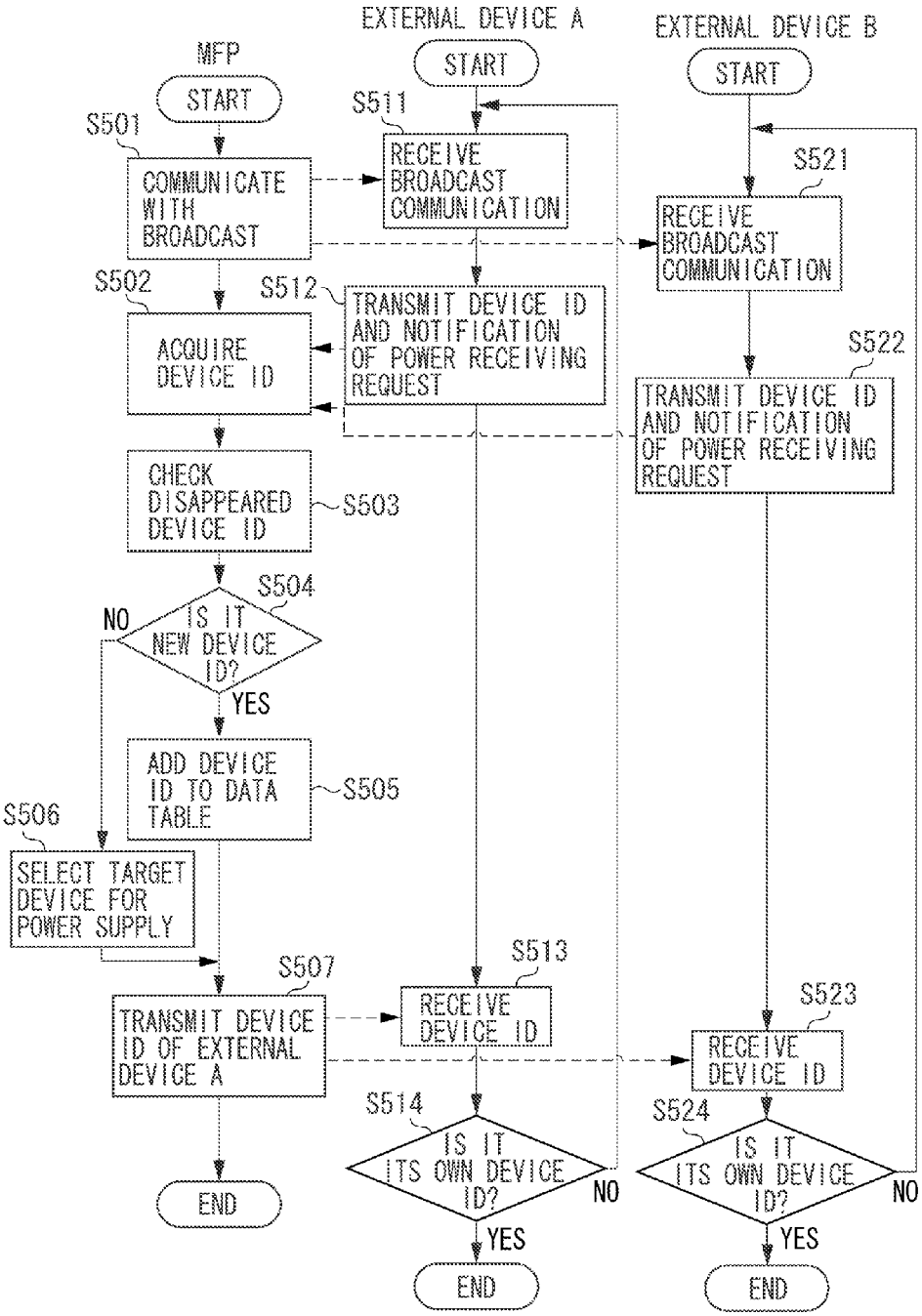

MFP
START
S501
COMMUNICATE WITH BROADCAST
S502
ACQUIRE DEVICE ID
CHECK DISAPPEARED DEVICE ID
S503
S504
IS IT NEW DEVICE ID?
NO
YES
ADD DEVICE ID TO DATA TABLE
S505
S506
SELECT TARGET DEVICE FOR POWER SUPPLY
S507
TRANSMIT DEVICE ID OF EXTERNAL DEVICE A
END
EXTERNAL DEVICE A
START
S511
RECEIVE BROADCAST COMMUNICATION
S512
TRANSMIT DEVICE ID AND NOTIFICATION OF POWER RECEIVING REQUEST
S513
RECEIVE DEVICE ID
S514
IS IT ITS OWN DEVICE ID?
NO
YES
END
EXTERNAL DEVICE B
START
S521
RECEIVE BROADCAST COMMUNICATION
S522
TRANSMIT DEVICE ID AND NOTIFICATION OF POWER RECEIVING REQUEST
S523
RECEIVE DEVICE ID
S524
IS IT ITS OWN DEVICE ID?
NO
YES
END

FIG. 7

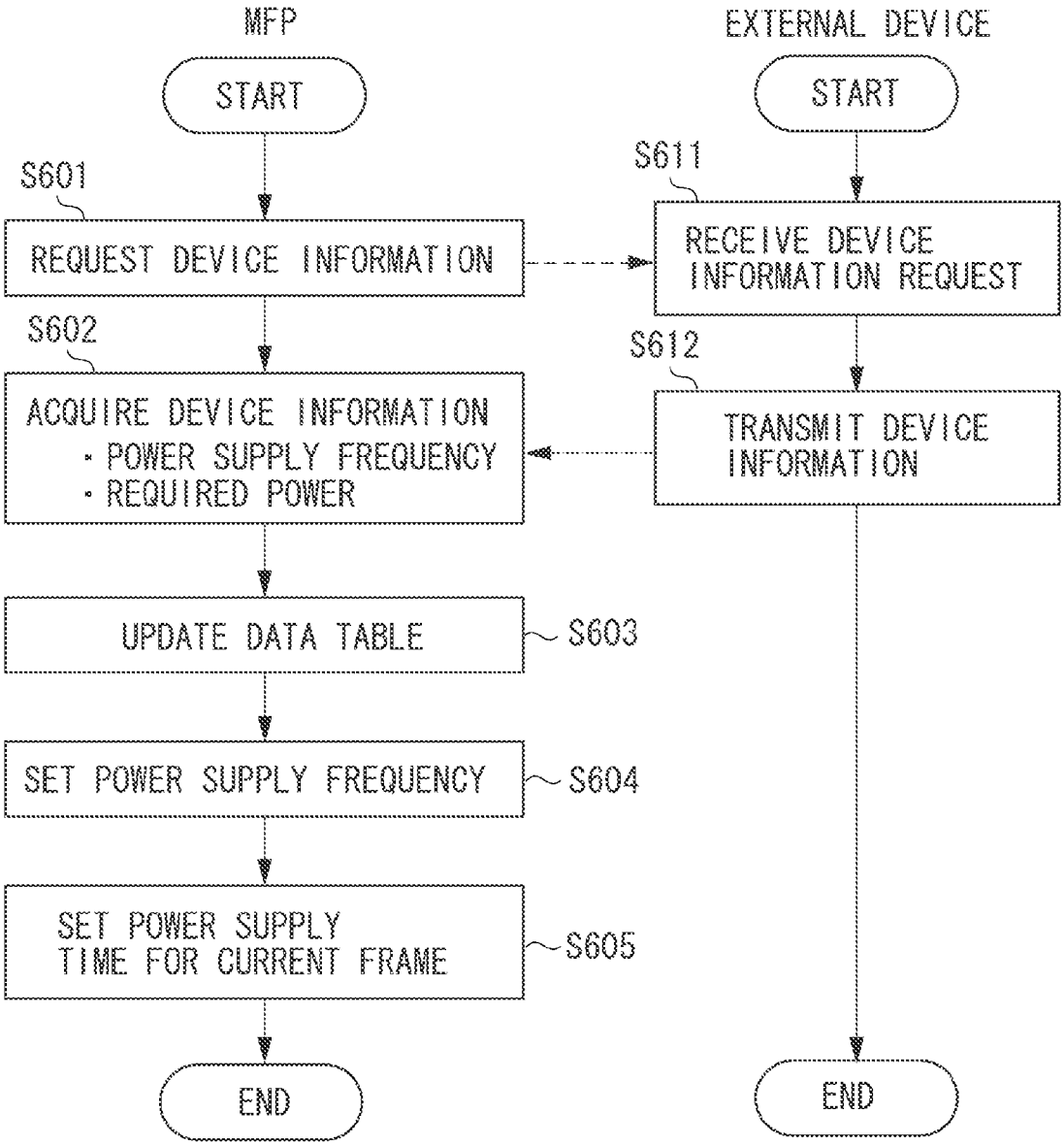

MFP
EXTERNAL DEVICE
START
START
S601
S611
REQUEST DEVICE INFORMATION
RECEIVE DEVICE INFORMATION REQUEST
S602
S612
ACQUIRE DEVICE INFORMATION
- POWER SUPPLY FREQUENCY
- REQUIRED POWER
TRANSMIT DEVICE INFORMATION
UPDATE DATA TABLE
S603
SET POWER SUPPLY FREQUENCY
S604
SET POWER SUPPLY TIME FOR CURRENT FRAME
S605
END
END

FIG. 8

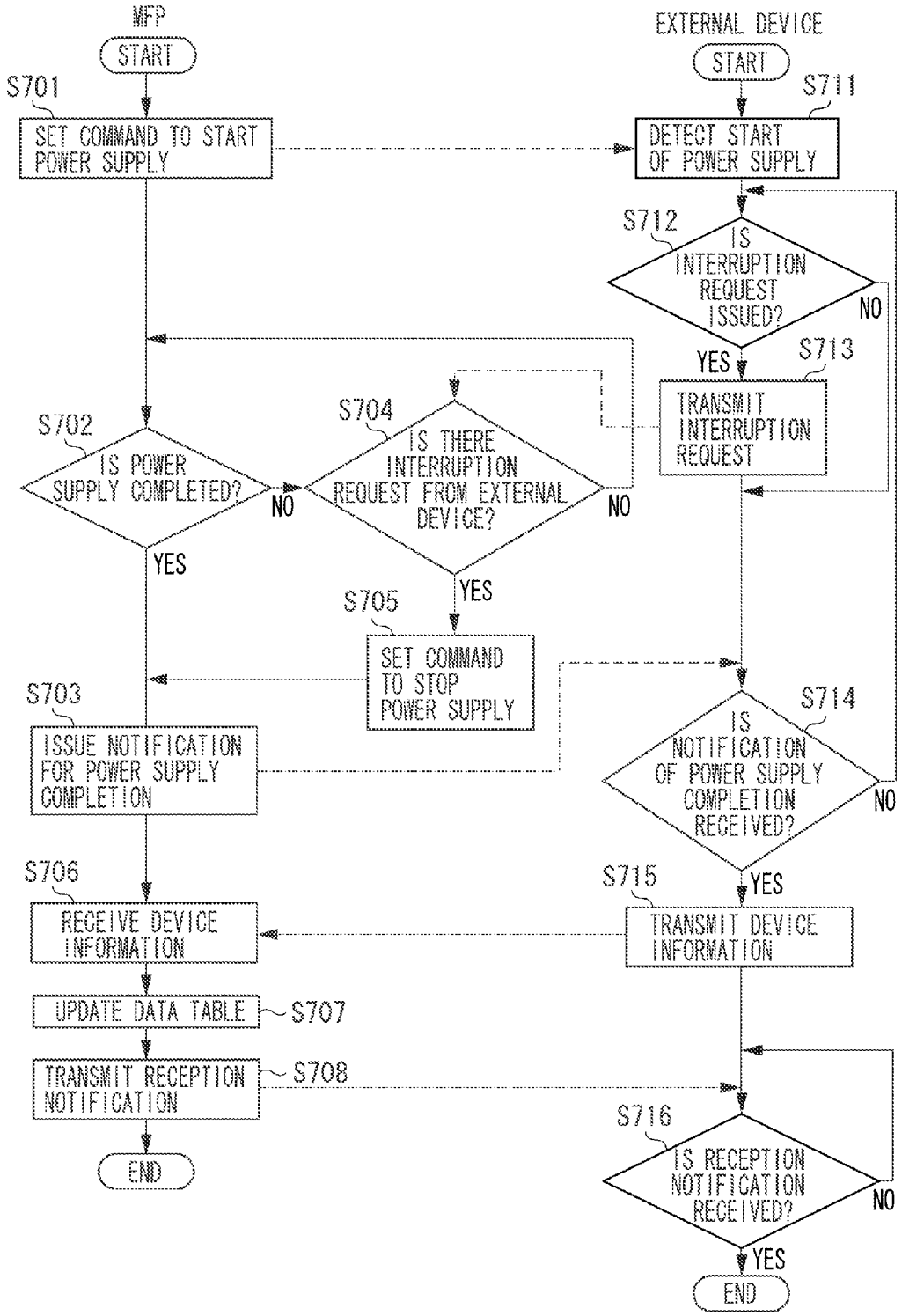

MFP
START
S701
SET COMMAND TO START POWER SUPPLY
S702
IS POWER SUPPLY COMPLETED?
NO
YES
S703
ISSUE NOTIFICATION FOR POWER SUPPLY COMPLETION
S704
IS THERE INTERRUPTION REQUEST FROM EXTERNAL DEVICE?
NO
YES
S705
SET COMMAND TO STOP POWER SUPPLY
S706
RECEIVE DEVICE INFORMATION
UPDATE DATA TABLE
S707
TRANSMIT RECEPTION NOTIFICATION
S708
END
EXTERNAL DEVICE
START
S711
DETECT START OF POWER SUPPLY
S712
IS INTERRUPTION REQUEST ISSUED?
NO
YES
S713
TRANSMIT INTERRUPTION REQUEST
S714
IS NOTIFICATION OF POWER SUPPLY COMPLETION RECEIVED?
NO
YES
S715
TRANSMIT DEVICE INFORMATION
S716
IS RECEPTION NOTIFICATION RECEIVED?
NO
YES
END

FIG. 9

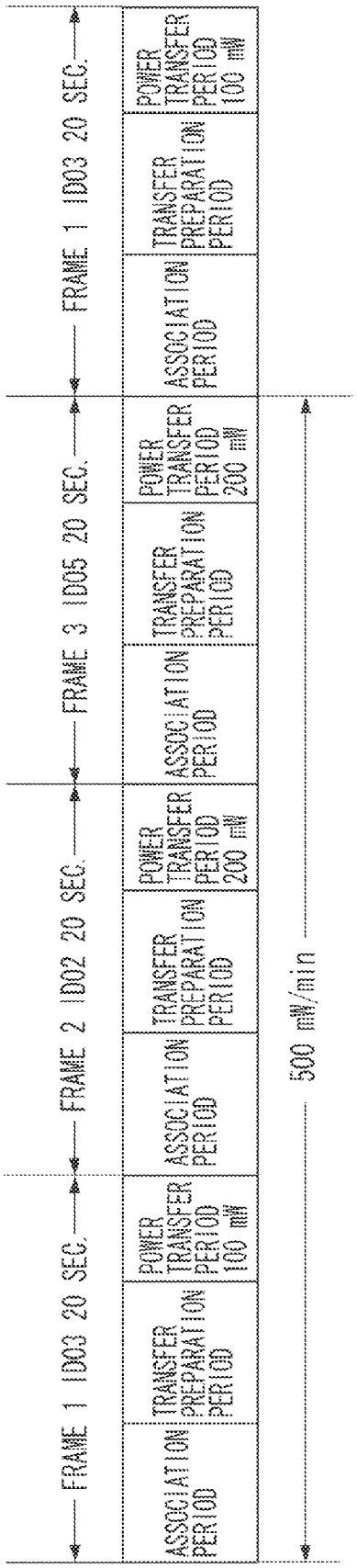

FRAME 1 ID03 20 SEC.
FRAME 2 ID02 20 SEC.
FRAME 3 ID05 20 SEC.
FRAME 1 ID03 20 SEC.
ASSOCIATION PERIOD
TRANSFER PREPARATION PERIOD
POWER TRANSFER PERIOD 100 mW
ASSOCIATION PERIOD
TRANSFER PREPARATION PERIOD
POWER TRANSFER PERIOD 200 mW
ASSOCIATION PERIOD
TRANSFER PREPARATION PERIOD
POWER TRANSFER PERIOD 200 mW
ASSOCIATION PERIOD
TRANSFER PREPARATION PERIOD
POWER TRANSFER PERIOD 100 mW
500 mW/min

FIG. 10

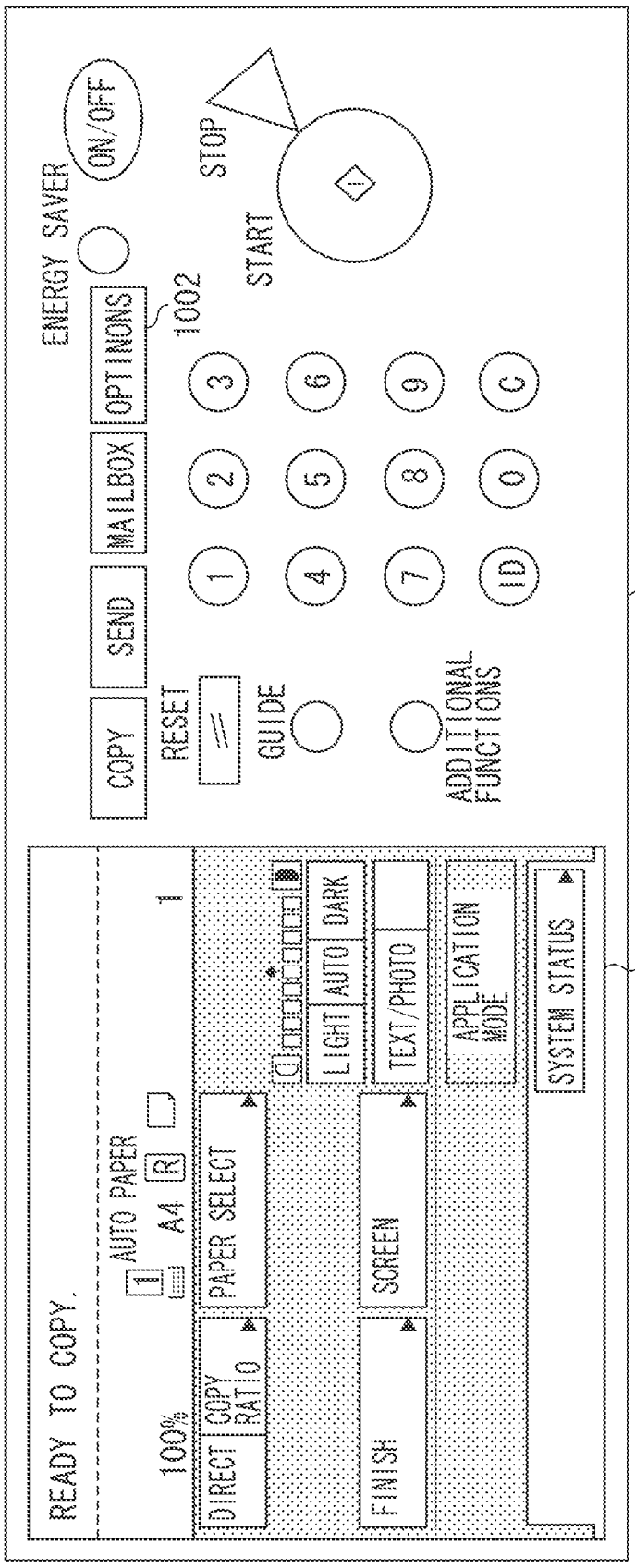

READY TO COPY.
AUTO PAPER
A4
100%
DIRECT
COPY RATIO
PAPER SELECT
FINISH
SCREEN
LIGHT
AUTO
DARK
TEXT/PHOTO
APPLICATION MODE
SYSTEM STATUS
1001
COPY
SEND
MAILBOX
OPTIONS
1002
RESET
GUIDE
ADDITIONAL FUNCTIONS
ENERGY SAVER
ON/OFF
START
STOP
211

FIG. 11

DEVICE ID	BATTERY CHARGING STATUS (%)	POWER SUPPLY STATUS	POWER SUPPLY AREA	PRIORITY FLAG	COOPERATION FLAG
ID01	50	STOP	OUT		
ID02	40	SUPPLY	IN	PRIORITY	
ID03	30	SUPPLY	IN		
ID04	80	SUPPLY	IN		PRINT
ID05	90	SUPPLY	IN		

FIG. 12

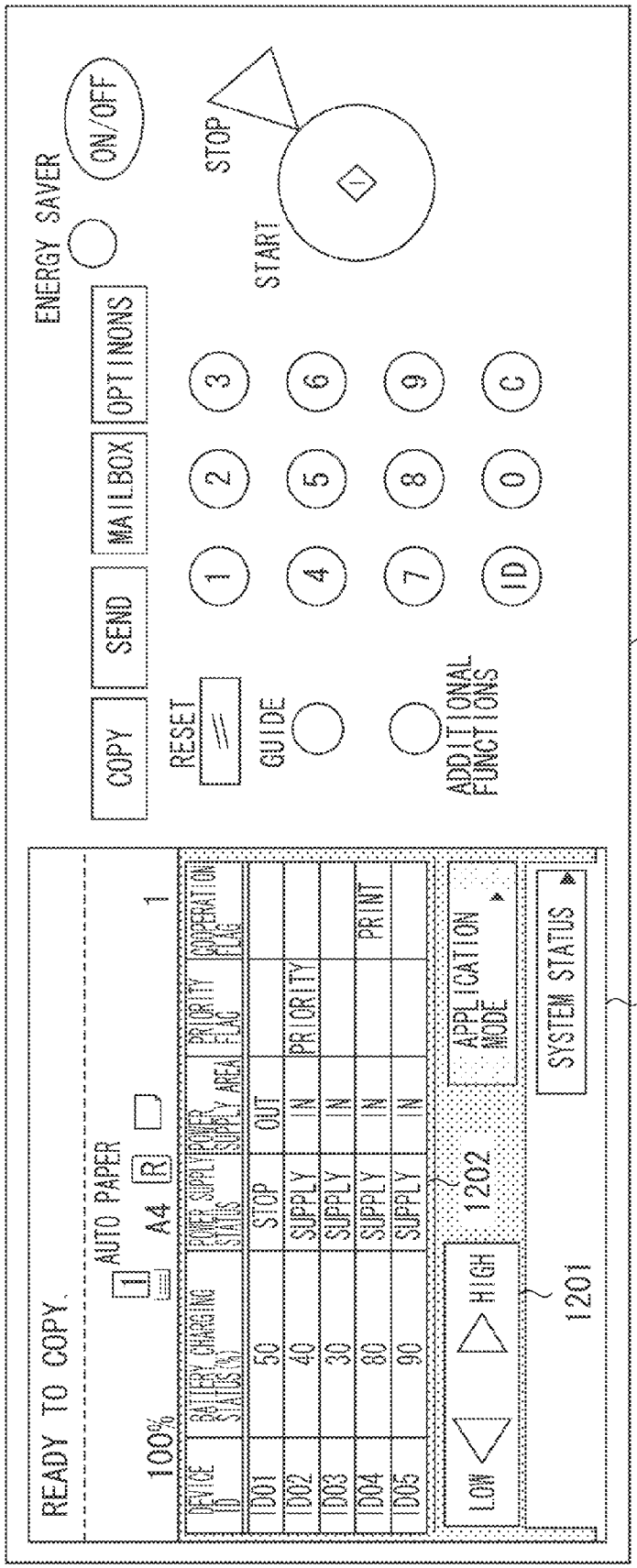

READY TO COPY.
100%
AUTO PAPER
A4
R
1
DEVICE ID
BATTERY CHARGING STATUS (%)
POWER SUPPLY/POWER SUPPLY AREA STATUS
PRIORITY FLAG
COOPERATION FLAG
1001
50
STOP
OUT
1002
40
SUPPLY
IN
PRIORITY
1003
30
SUPPLY
IN
1004
80
SUPPLY
IN
PRINT
1005
90
SUPPLY
IN
LOW
HIGH
1201
1202
APPLICATION MODE
SYSTEM STATUS
COPY
SEND
MAILBOX
OPTIONS
ENERGY SAVER
ON/OFF
RESET
GUIDE
ADDITIONAL FUNCTIONS
1
2
3
4
5
6
7
8
9
ID
0
C
START
STOP
211

FIG. 13

DEVICE ID	BATTERY CHARGING STATUS(%)	POWER SUPPLY STATUS	POWER SUPPLY AREA	PRIORITY FLAG	COOPERATION FLAG
ID01	50	SUPPLY	IN		
ID02	40	STOP	OUT		
ID03	30	SUPPLY	IN		
ID04	80	STOP	OUT		
ID05	90	STOP	OUT		

FIG. 14

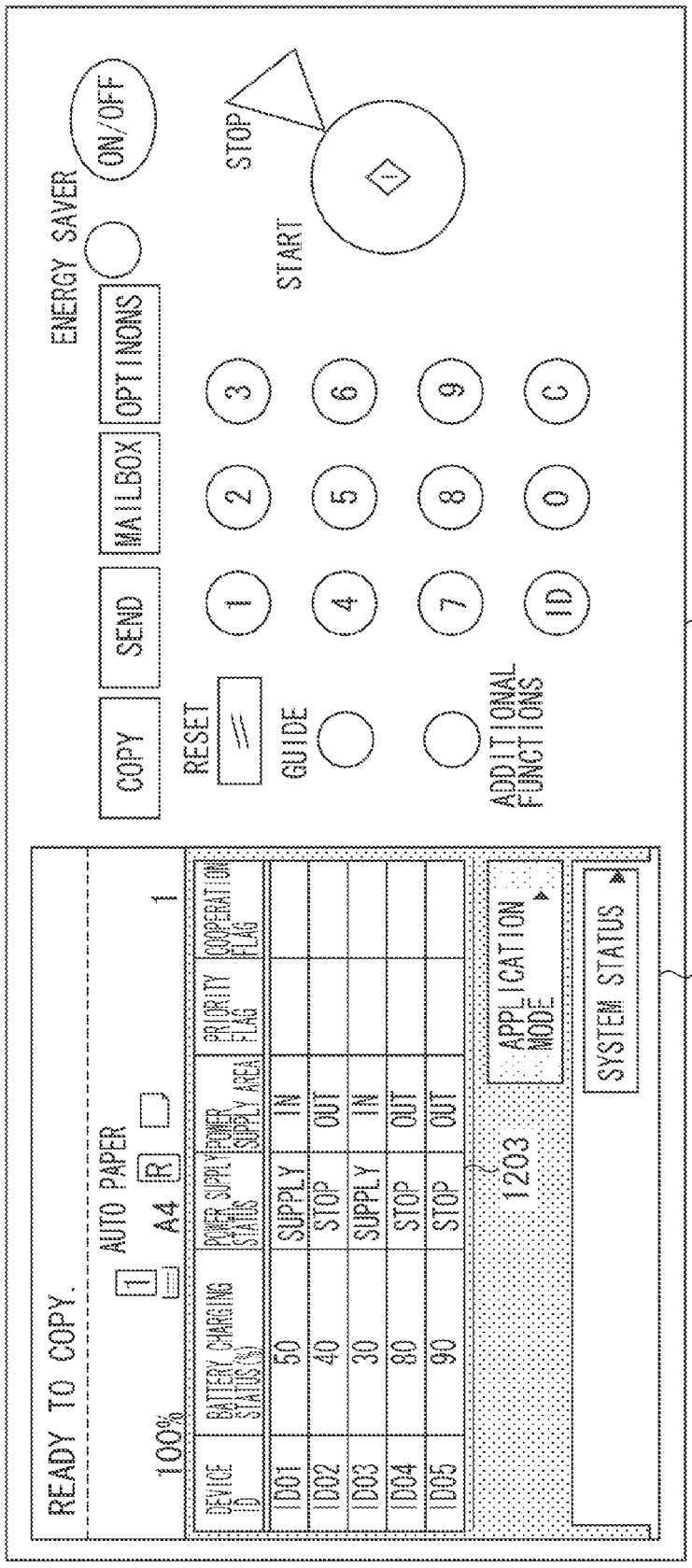

READY TO COPY.
100%
AUTO PAPER
A4
1
DEVICE ID
BATTERY CHARGING STATUS(%)
POWER SUPPLY/TONER STATUS
SUPPLY AREA
PRIORITY FLAG
COOPERATION FLAG
ID01 50 SUPPLY IN
ID02 40 STOP OUT
ID03 30 SUPPLY IN
ID04 80 STOP OUT
ID05 90 STOP OUT
1203
APPLICATION MODE
SYSTEM STATUS
1001
COPY
SEND
MAILBOX
OPTIONS
ENERGY SAVER
ON/OFF
RESET
GUIDE
ADDITIONAL FUNCTIONS
START
STOP
211

FIG. 15

DEVICE ID	BATTERY CHARGING STATUS (%)	POWER SUPPLY STATUS	POWER SUPPLY AREA	PRIORITY FLAG	COOPERATION FLAG
ID01	50	STOP	OUT		
ID02	40	STOP	OUT		
ID03	30	STOP	OUT		
ID04	80	STOP	OUT		
ID05	90	STOP	OUT		

FIG. 16

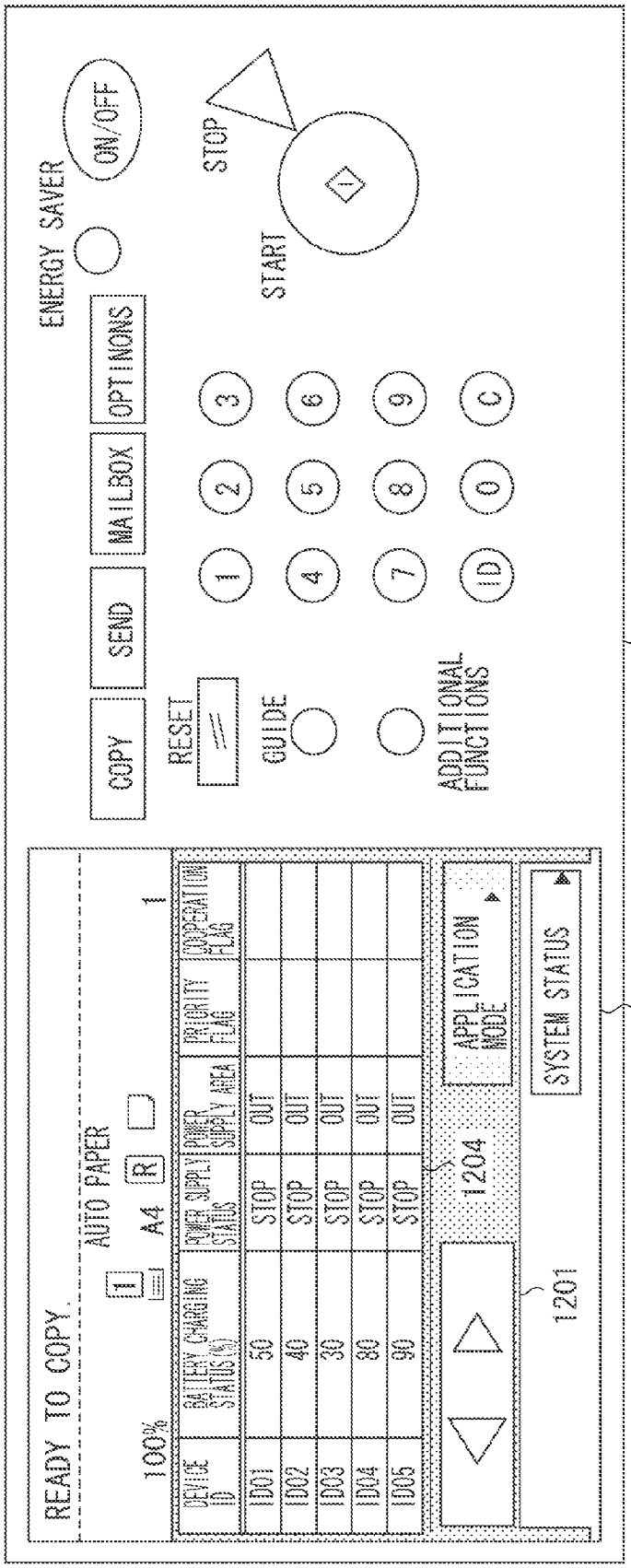
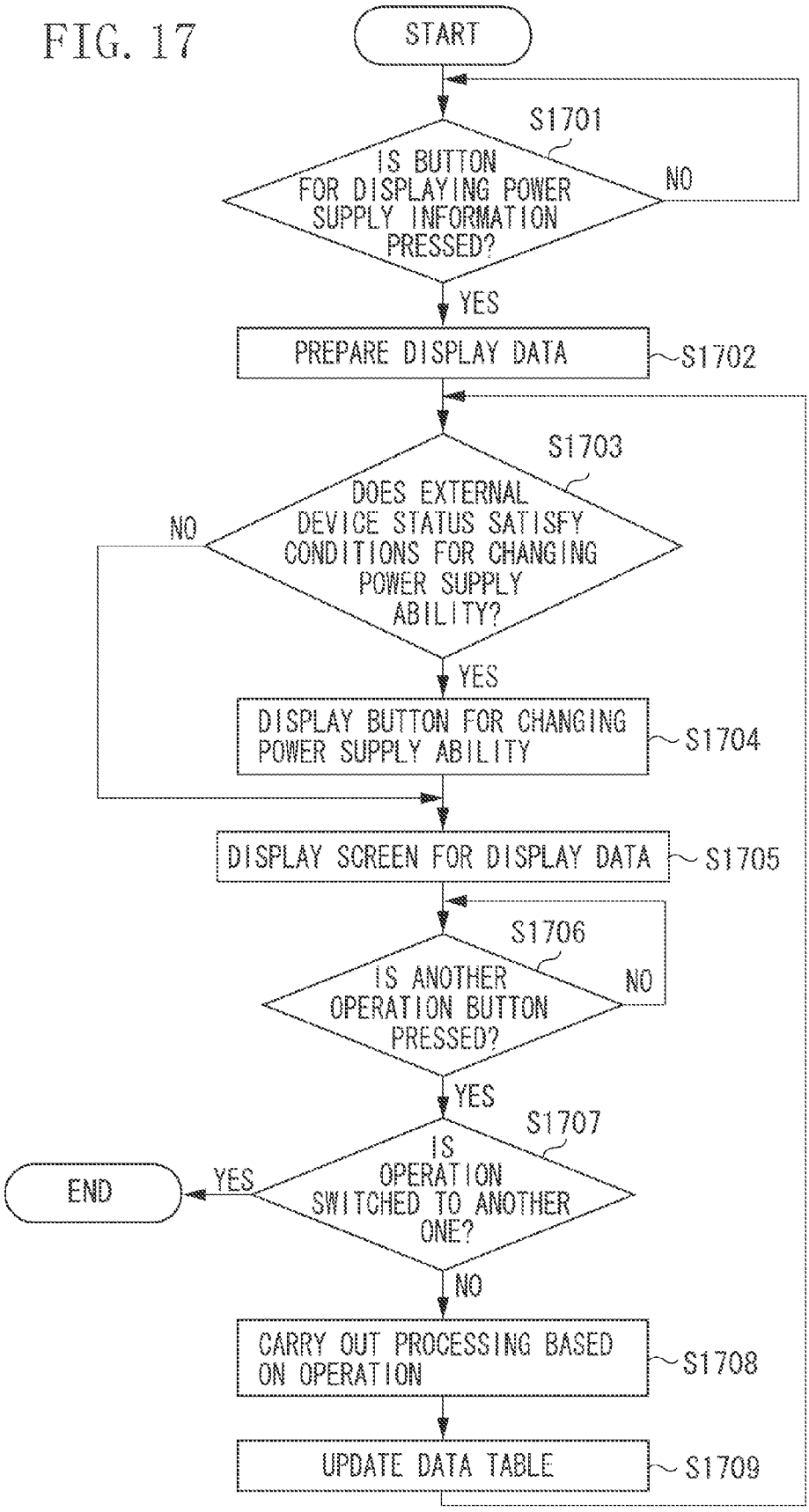

READY TO COPY.
AUTO PAPER
100%
A4
R
1
DEVICE ID
BATTERY CHARGING STATUS(%)
POWER SUPPLY STATUS
POWER SUPPLY AREA
PRIORITY FLAG
COOPERATION FLAG
ID01 50 STOP OUT
ID02 40 STOP OUT
ID03 30 STOP OUT
ID04 80 STOP OUT
ID05 90 STOP OUT
1204
APPLICATION MODE
SYSTEM STATUS
1201
1001
COPY
SEND
MAILBOX
OPTIONS
ENERGY SAVER
ON/OFF
RESET
GUIDE
ADDITIONAL FUNCTIONS
START
STOP
211

FIG. 17


START
S1701
IS BUTTON FOR DISPLAYING POWER SUPPLY INFORMATION PRESSED?
NO
YES
PREPARE DISPLAY DATA
S1702
S1703
DOES EXTERNAL DEVICE STATUS SATISFY CONDITIONS FOR CHANGING POWER SUPPLY ABILITY?
NO
YES
DISPLAY BUTTON FOR CHANGING POWER SUPPLY ABILITY
S1704
DISPLAY SCREEN FOR DISPLAY DATA
S1705
S1706
IS ANOTHER OPERATION BUTTON PRESSED?
NO
YES
S1707
IS OPERATION SWITCHED TO ANOTHER ONE?
YES
END
NO
CARRY OUT PROCESSING BASED ON OPERATION
S1708
UPDATE DATA TABLE
S1709

POWER SUPPLY APPARATUS, IMAGE FORMING APPARATUS, POWER SUPPLY METHOD, AND PROGRAM

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a power supply apparatus, an image forming apparatus, a power supply method, and a program.

2. Description of the Related Art

In general, mobile terminals such as cell phones, smartphones, tablet personal computers, and notebook personal computers are equipped with their own batteries, thus eliminating the use of power cables to improve portability and pursue user-friendliness. Furthermore, there is a known technique that allows a charging apparatus to charge the battery in a non-contact (wireless) manner without any connection unit such as a connector.

Japanese Patent Application Laid-Open No. 2012-16170 discusses a device as a technique for a power supply apparatus. The device is able to detect a positional change of a power receiving apparatus and allow a display unit of a power supply apparatus to display a charging state of the power receiving apparatus having such a change.

Furthermore, multifunction peripherals (MFPs) have developed so that they can cooperate with mobile terminals such as those described above to give a desired print output and to receive a scanner input via wireless network.

Another known technique allows an MFP and a mobile terminal to cooperate with each other. Through this technique, power is supplied to the mobile terminal by wireless power supply using the MFP as a power-supplying point. This technology allows a user to perform processing without consideration of draining of a battery during cooperation between the MFP and the mobile terminal.

In the conventional technique for wireless power supply, a power supply apparatus automatically acquires a power supply protocol and the identification number of a power receiving apparatus in a power supply zone, and then automatically performs wireless power supply upon establishment of a power supply link.

However, when using the MFP as a power supply point, a mobile terminal user approaching the point to cooperate with the MFP does not always desire power supply. In other words, the conventional technique for wireless power supply has a problem in that a user may receive unnecessary power supply.

SUMMARY OF THE INVENTION

The present invention is directed to a power supply apparatus and an image forming apparatus that perform power supply upon a user's request.

According to an aspect of the present invention, a power supply apparatus includes a display control unit configured to display external devices allowed to receive power from the power supply apparatus, an input reception unit configured to receive, from a user, an input for selecting an external device as a power supply target from among the displayed external devices, and a power supply target device identification unit configured to identify the selected external device as a power supply target.

Further features of the present invention will become apparent from the following description of exemplary embodiments with reference to the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a diagram illustrating an MFP and external devices.

FIG. **2** is a diagram illustrating the configuration of the MFP.

FIG. **3** is a diagram illustrating a data table.

FIG. **4** is a diagram illustrating power supply processing.

FIG. **5** is a diagram illustrating frames.

FIG. **6** is a diagram illustrating processing in an association period.

FIG. **7** is a diagram illustrating processing in a transfer preparation period.

FIG. **8** is a diagram illustrating processing in a power transfer period.

FIG. **9** is a diagram illustrating an example of a resulting frame allocation.

FIG. **10** is a diagram illustrating an operation unit.

FIG. **11** is a diagram illustrating an example of display data.

FIG. **12** is a diagram illustrating a display example of a display data screen.

FIG. **13** is a diagram illustrating an example of display data.

FIG. **14** is a diagram illustrating a display example of a display data screen.

FIG. **15** is a diagram illustrating an example of display data.

FIG. **16** is a diagram illustrating a display example of a display data screen.

FIG. **17** is a diagram illustrating display processing.

DESCRIPTION OF THE EMBODIMENTS

Various exemplary embodiments, features, and aspects of the invention will be described in detail below with reference to the drawings.

FIG. **1** is a diagram illustrating a digital multifunction peripheral/multifunction printer (MFP) **101** supplying power to external devices **102**, **103**, and **104**. The MFP **101** serves as an image forming apparatus having a power supply unit.

The MFP **101** performs wireless power supply to the external devices **102**, **103**, and **104**. The MFP **101** of the present exemplary embodiment is a system including an operation unit for allowing a user to monitor and control the wireless power supply.

The external device **102** illustrated in FIG. **1** is a digital camera. In addition, the external devices **103** and **104** are smartphones. The number and kinds of the external devices to which the MFP **101** can supply power are not limited to those of the present exemplary embodiment.

As illustrated in FIG. **1**, the MFP **101** serves as a power supply point for wireless power supply. A transmissible area **105** illustrated in FIG. **1** is an area where the external devices **102** to **104** can perform wireless communication with the MFP **101**. In other words, the external devices **102** to **104** can communicate with the MFP **101** when they locate within the transmissible area **105**.

A power suppliable area **106** illustrated in FIG. **1** is an area where the MFP **101** can perform wireless power supply. In other words, the external devices **102** to **104** can respectively receive suitable amounts of wireless power supply from the MFP **101** when they locate within the power suppliable are **106**. The power suppliable area **106** is defined by the amount of power that can be supplied by the MFP **101**, that is, the power supply ability of the MFP **101**.

In an example illustrated in FIG. **1**, the external devices **102** and **104** locate outside the power suppliable area **106** and inside the transmissible area **105**. Thus, the external devices **102** and **104** only communicate with the MFP **101**. On the other hand, the external device **103** locates inside the power

suppliable area **106**. Thus, the external device **103** can receive power supply from the MFP **101**.

The MFP **101** of the present exemplary embodiment identifies an external device as a target for power supply in response to an instruction from a user. Furthermore, the MFP **101** communicates with the external device to acquire status information that represents the state of the external device, followed by changing the boundary of the power suppliable area **106** based on the status information.

FIG. **2** is a diagram illustrating the configuration of the MFP **101**. The MFP **101** includes a controller unit **203**, a scanner **201**, a printer **202**, and an operation unit **211**. The scanner **201** includes a unit for reading out information from a document on a platen. In addition, the MFP **101** can mount a document feeder (not illustrated) on the scanner **201**. The document feeder allows the scanner **201** to effectively read a plurality of documents.

The printer **202** has a printing function. The printer **202** includes a unit for printing out an image read by the scanner **201**, an image transferred via an IP network **213**, and an image stored in a hard disk drive (HDD) **217**.

The operation unit **211** serves as a user interface. The operation unit **211** includes an input unit that allows the user to input an instruction, and display unit that displays information. The input unit is, for example, a unit such as a keyboard for allowing the user to input instruction data or a unit such as a pointing device for allowing the user to specify an area. The display unit is, for example, a display screen for displaying document information.

The controller unit **203** includes a scanner interface (I/F) **204**, a printer interface (I/F) **205**, an image processing unit **206**, a control unit **207**, and an operation control unit **209**. The controller unit **203** also includes the HDD **217** and a hard disk controller **216**. Here, the HDD **217** and the hard disk controller **216** are installed in the MFP **101** to form a storage unit. The controller unit **203** also includes a network interface (I/F) **210** and a bus **212**. The network I/F **210** is an interface to the outside. The bus **212** controls every unit of the controller unit **203** and makes connections among the units. The HDD **217** is a storage device for temporary storing various kinds of data including scanned images and print images.

The image processing unit **206** performs optimal image processing for transferring an image read by the scanner **201** to each unit. For example, the image processing unit **206** transfers an image to the HDD **217**. The image processing unit **206** also transfers a scanned image to an external device via the network I/F **210**. The image processing unit **206** performs optimal compression on an image when transferring the image.

Furthermore, the image processing unit **206** performs image processing for obtaining print output from the printer **202**. A print image source is an image read by the scanner **201**, an image stored in the HDD **217**, or the like. Alternatively, for example, the print image source may be a print image transferred via the IP network **213** and the network I/F **210**. The image processing unit **206** performs various kinds of image processing such as expansion processing and resolution conversion processing, to suitably print out a document according to each of the image sources.

The control unit **207** controls the image processing unit **206**, the scanner I/F **204**, and the printer I/F **205**, all of which are connected therewith via the bus **212**, to handle images. The operation control unit **209** controls the operation unit **211** to convert user's instruction data into a different form that can be instructed and controlled by the control unit **207**.

A power supply unit **221** plugs in a socket of an alternating current (AC) power source (commercial power source) to supply power to the entire MFP **101**. A power unit **220** converts the AC voltage supplied from the power supply unit **221** into a direct current (DC) voltage, followed by supplying the DC voltage as a power source for each load. The power unit **220** includes a main power switch (SW) (not illustrated).

A power supply communication unit **222** is a communication unit for identifying and authenticating a device in communication when the MFP **101** performs wireless power supply to an external device (a power-receiving device) that desires power from the MFP **101**. The power supply communication unit **222** connects to a communication unit antenna **223**. The power supply communication unit **222** performs wireless communication with an external device by a wireless communication system such as neighborhood wireless communication.

A wireless power supply unit **224** is a power supply unit for performing contactless power supply to an external device. The wireless power supply unit **224** connects to a power supply unit antenna **225**. The wireless power supply unit **224** supplies electric energy to the external device via the power supply unit antenna **225**. Examples of the contactless power supply method include an electromagnetic induction system, an electric field/magnetic field resonance system, and a radio wave receiving system. The user can specify or change, by operating the operating unit **211**, the amount of power to be supplied from the wireless power supply unit **224** to an external device, that is, the power supply ability of the wireless power supply unit **224**.

The control unit **207** is responsible for entire control of the controller unit **203**. The control unit **207** includes a central processing unit (CPU) **214** as the core of control. The control unit **207** includes a memory **208** such as a read-only memory (ROM) for controlling a program carried out by the CPU **214** and a work random access memory (RAM) serving as a temporary usage memory.

Furthermore, the processing described below can be carried out by the CPU **214**. That is, the CPU **214** reads out programs stored in the memory **208** and executes the programs to cooperate with the memory **208** such as a work RAM used as a temporary usage memory to carry out the respective processing.

In the following processing, furthermore, an external device performs its processing in a manner similar to the MFP **101** such that the CPU of the external device reads out a program stored in its memory and executes such a program.

FIG. **3** is a diagram schematically illustrating a data table stored in the memory **208**. The CPU **214** refers to and updates the data table through the processing described below. The device identification number (ID) of the data table is a unique ID of an external device to which the MFP **101** can supply power, that is, a unique ID of a power receptive device.

In addition to power supply processing described below, the MFP **101** receives device IDs from external devices when the MFP **101** cooperates with the external devices via the IP network **213** in processing such as printing or scanning.

A power supply frequency is the resonance frequency of power when the wireless power supply unit **224** supplies power to the external devices. By changing the frequency, the wireless power supply unit **224** performs wireless power supply to a specific external device. The unit of the power supply frequency in FIG. **3** is kilohertz (KHz).

In FIG. **3**, required power represents the amount of power required by an external device when the external device receives wireless power supply. The unit of the required power in FIG. **3** is milliwatt per minute (mW/min). In other words, the required power is the amount of power received by the external device per minute. The CPU **214** acquires infor-

mation including a power supply frequency and required power from the external device in step S602 of the processing described below (FIG. 7), followed by writing them in the data table in step S603.

In FIG. 3, area represents information indicating whether the external device locates on the outside or the inside of the power suppliable area 106. "IN" represents that the external device locates on the inside of the power suppliable area 106. "OUT" represents that the external device locates on the outside of the power suppliable area 106. The area is data acquired by the CPU 214 from the external device in step S706 of the processing described below (FIG. 8).

In FIG. 3, battery charging status is a charging amount of a battery attached to the external device. The battery charging status is data acquired by the CPU 214 from the external device in step S706 of the processing described below (FIG. 8). The unit of the charging amount in FIG. 3 is percent (%). The charging amount of the battery is 100% when fully charged.

In FIG. 3, a power supply flag is a flag that represents whether power is being supplied ("Supply") or not ("Stop"). In the case of power not being supplied, the CPU 214 sets "Stop" in the power supply flag. During the power supply, the CPU 214 sets "Supply" in the power supply flag. The details of the processing will be described below.

In FIG. 3, a priority flag represents information indicating an external device to which power is preferentially supplied. In other words, the external device corresponding to the priority flag preferentially receives power supply in comparison with other external devices. The user can operate the operation unit 211 to select a desired external device, and to set the priority flag thereto. A cooperation flag represents the external device in cooperation operation. Here, examples of the cooperation operation include scanning/printing executed by the external device and the MFP 101 via the IP network 213. When the device ID received from the external device during the cooperation operation of the MFP 101 matches the device ID on the data table, the MFP 101 associates the device ID with the cooperation flag, thereby setting the flag. Specifically, the MFP 101 sets a print flag, for example, to the external device in printing operation.

FIG. 4 is a sequence diagram illustrating the power supply processing performed by the MFP 101. In the power supply processing, the MFP 101 performs wireless power supply to an external device. Even though FIG. 4 illustrates only one external device, the MFP 101 is able to communicate with a plurality of external devices.

As illustrated in FIG. 3, the power supply processing is broadly divided into steps in three periods; steps S301, S302, and S303 in an association period; steps S304 and S305 in a transfer preparation period; and steps S306, S307, S308, and S309 in a power transfer period. The MFP 101 organizes these three periods (the association period, the transfer preparation period, and the power transfer period) into one frame, and repeats the frame to perform wireless power supply.

The details of each step will be described below.

<Association Period>

In association request (ARQ) processing in step S301, the CPU 214 issues a communication command to the power supply communication unit 222 via the bus 212. The power supply communication unit 222 performs broadcast communication to each external device in response to the communication command, thereby notifying an external device requesting power supply of the start of power supply.

In association response (ARS) processing in step S302, the CPU 214 makes, via the bus 212, the power supply communication unit 222 receive a device ID from an external device requesting power supply. Then, the CPU 214 detects the external device requesting power supply by the ARS processing.

In response acknowledgement (RA) processing in step S303, the CPU 214 selects, from among the received device IDs, the device ID of an external device to which power is supplied. Then, the CPU 214 replies the device ID of the selected external device from the power supply communication unit 222 via the bus 212. Thus, the CPU 214 acknowledges power supply to the external device. At this time, an unacknowledged external device waits the ARQ processing of the next frame.

<Transfer Preparation Period>

In data request (DRQ) processing in step S304, the CPU 214 transmits, from the power supply communication unit 222 via the bus 212, the device ID of an external device to which power is supplied. Then, the CPU 214 requests the required information about the target external device therefrom, the information which is required for performing power supply. The required information includes, for example, power propagation frequency, required power of the device, and the unique information about the device.

In response frame processing in step S305, the CPU 214 makes the power supply communication unit 222 receive each piece of the information from the requested external device, and then receives the information via the bus 212. The CPU 214 stores the received information in the memory 208. The CPU 214 executes a program that causes the wireless power supply unit 224 to supply power based on the received information. For example, the CPU 214 calculates time for supplying power to the external device selected in the association period. Here, the CPU 214 defines the value of the power supply time based on a wireless supply power from the wireless power supply unit 224, the required power of the external device, and the power transfer efficiency.

<Power Transfer Period>

In transferring power processing in step S306, the CPU 214 issues a command to the wireless power supply unit 224 via the bus 212 to start power supply. The commands to be set are those for determining the power supply time and for starting power supply. In termination of power transfer in step S307, the wireless power supply unit 224 terminates the power supply when the power supply time is over. Furthermore, the CPU 214 receives a notification of power supply completion from the wireless power supply unit 224 via the bus 212. The CPU 214 causes the power supply communication unit 222 to notify the external device of termination of power supply.

In data in step S308, the CPU 214 causes the power supply communication unit 222 to receive the notification of power supply completion from the external device via the bus 212. In step S308, the CPU 214 receives data such as the amount of power received and the charging amount of a battery. Then, the memory 208 stores the data as power supply data. In data acknowledgement (DA) in step S309, the CPU 214 causes the power supply communication unit 222 to notify the external device of the receipt of the power supply data via the bus 212, completing the frame.

The CPU 214 causes the power supply communication unit 222 to communicate with the external device via the bus 212 to acquire various kinds of information from the external device during the power transfer period in step S306. In other words, the CPU 214 can suitably execute the processing of steps S308 and S309 for receiving the power supply data from the external device after execution of the transferring power processing in step S306. Therefore, when an unexpected event or the like occurs in the external device, for example, the CPU 214 can promptly receive a request such as the request

for stopping power supply from the external device. In other words, the CPU **214** can promptly stop the power supply to the external device.

FIG. **5** is a diagram illustrating consecutive frames each including the association period in steps S**301**, S**302**, and S**303**, the transfer preparation period in steps S**304** and S**305**, and the power transfer period in step S**306**, S**307**, S**308**, and S**309**.

In each frame, the MFP **101** performs power supply to different external devices authenticated in the association period in steps S**301**, S**302**, and S**303**. The MFP **101** performs power supply to different external devices in each of the consecutive frames to attain power supply to a plurality of external devices.

FIG. **6** is a sequence diagram illustrating processing carried out in the association period in detail. Processing performed by the MFP **101** and external devices A and B will be described with reference to FIG. **6**. Here, the number of external devices with which the MFP **101** communicates is not limited to that described in the present exemplary embodiment. First, when the processing in the association period is performed, in step S**501**, the CPU **214** of the MFP **101** causes the power supply communication unit **222** to notify the external device of the start of power supply via broadcast communication.

In steps S**511** and S**521**, the external devices A and B receive information indicating the start of power supply from the MFP **101** via the broadcast communication, respectively. If the external devices A and B desire the reception of power, the processing proceeds to steps S**512** and **5522**, respectively. In steps S**512** and S**522**, the external devices A and B transmit notifications of power receiving request together with their own device IDs to the MFP **101**, respectively.

In step S**502**, the CPU **214** of the MFP **101** causes the power supply communication unit **222** to receive the device ID from an external device requesting power supply. If there is a plurality of external devices requesting power supply, the CPU **214** sequentially receives the device IDs of the respective external devices (reception processing). Subsequently, when receiving a device ID, the CPU **214** identifies a source external device transmitting the device ID as an external device allowed to receive power from the MFP **101** (power receptive device identification processing). Here, the received device ID identifies the source external device.

In step S**503**, the CPU **214** makes a comparison between the received device ID (the device ID of the external device allowed to receive power from the MFP **101**) and the device IDs stored in the data table. Then, if there is a device ID not acquired in step S**502** among the device IDs stored in the data table, the CPU **214** deletes any record corresponding to the unacquired device ID from the data table.

In step S**504**, the CPU **214** refers to the data table and then determines whether the data table includes the device ID acquired in step S**502**. If the data table does not include the acquired device ID, that is, such a device ID is the device ID of a new external device, the CPU **214** performs processing in step S**505**. If the data table includes the acquired device ID, that is, such a device ID is the device ID of the external device already supplied with power in the frame already subjected to the power supply processing, the CPU **214** performs processing in step S**506**.

In Step S**505**, the CPU **214** creates a record of a new device ID and adds the record to the data table. Thus, in this step in the power supply processing, the CPU **214** appropriately adds the information of the external device (power receptive device) to the data table as a new record, thereby updating the record.

In step S**505**, the CPU **214** selects a device with a new device ID as a target device for power supply. In this way, when the CPU **214** detects a new external device, the CPU **214** preferentially selects the new external device as a target device for power supply.

In step S**506**, the CPU **214** selects the device ID of the external device to which power is supplied in the current frame, in other words, the device ID of the target device for power supply among the received device IDs. During processing for selecting the target device for power supply, the CPU **214** refers to the power supply ability of the MFP **101** and the required power of each external device stored in the data table. More specifically, the CPU **214** allocates processing time and a frame ID to each frame. Then, the CPU **214** sequentially selects target devices for power supply by selecting the frame IDs.

In the processing for selecting a target device for power supply, for example, the CPU **214** selects a target device for power supply with reference to the order of entries or in the order of registrations which are preregistered when the wireless power supply unit **224** has sufficient power supply ability. If the priority is predetermined, the CPU **214** may select the target devices for power supply in the order of precedence.

In step S**507**, the CPU **214** causes the power supply communication unit **222** to transmit the device ID of the target device for power supply to the authenticated external device to notify the user of authentication of power supply. Here, the CPU **214** preferentially authenticates a new external device. Consequently, the MFP **101** completes its processing in the association period. Subsequently, the MFP **101** performs the processing in the transfer preparation period.

In steps S**513** and S**523**, on the other hand, the external devices A and B receive device IDs and perform the processing in steps S**514** and S**524**, respectively. In steps S**514** and S**524**, the external devices A and B determine whether the received device IDs are their own device IDs, respectively.

If the device IDs are their own device IDs, the external devices A and B terminate the processing in the association period, followed by performing the processing in the transfer preparation period. If the device IDs are not their own device IDs, the processing of the external devices A and B returns to step S**511** and S**521**, respectively. Subsequently, the external devices A and B wait for the broadcast communication in the association period of the next frame.

In step S**506**, for example, if the MFP **101** selects the external device A, then the external device A completes the processing in the association period. Subsequently, the external device A performs the processing in the transfer preparation period. At this time, the external device B returns to the processing in step S**521**, followed by waiting for the broadcast communication in the association period of the next frame.

FIG. **7** is a sequence diagram illustrating the processing in the transfer preparation period in detail. The processing in the transfer preparation period will be described with reference to FIG. **7** using the processing performed when the external device A is selected in the association period as an example. First, in step S**601**, the CPU **214** of the MFP **101** causes the power supply communication unit **222** to transmit a request for the device information together with the device ID of the external device to be authenticated and supplied with power. The device information includes frequency information for performing power supply, required power to be supplied to the external device A, and the like.

In step S**611**, the external device A receives a request for the device information together with its own device ID. In

step S612, the external device A transmits the requested device information, thereby completing the processing in the transfer preparation period.

On the other hand, in step S602, the CPU 214 of the MFP 101 acquires the required information, that is, the device information, from the external device to which power is supplied.

Next, in step S603, the CPU 214 associates the acquired device information with the device ID, followed by adding the device information to the data table. In other words, the CPU 214 updates the data table.

In step S604, the CPU 214 refers to the data table and sets a power supply frequency to the wireless power supply unit 224. In step S605, the CPU 214 refers to the data table, calculates power supply time in the current frame, and sets the power supply time to the wireless power supply unit 224. Consequently, the MFP 101 completes its processing in the transfer preparation period. Processing for calculating power supply time will be described below.

FIG. 8 is a sequence diagram illustrating processing carried out in the power transfer period in detail. The processing in the power transfer period will be described with reference to FIG. 8 using the processing performed when the external device A is selected in the association period as an example. In step S701, the CPU 214 of the MFP 101 sets a power supply start command to the wireless power supply unit 224. Then, the MFP 101 starts power supply (power supply processing). In contrast, in step 711, the external device A detects the start of power supply from the MFP 101.

Subsequently, in step S712, the external device A determines whether the power supply interruption to be requested to the MFP 101. For instance, if predetermined conditions are satisfied, the external device A requests an interruption of power supply. Here, in the external device A, conditions for coping with an unanticipated situation are predefined.

If the external device A does not request an interruption of power supply (NO in step S712), the external device A proceeds to the processing in step 714, followed by repeating the processing in steps S712 to S714 until the external device A receives a notification of power supply completion. If the external device A requests an interruption of power supply (YES in step S712), the external device A proceeds to the processing in step S713. In other words, in step S713, the external device A transmits an interruption request to the MFP 101. Subsequently, the external device A proceeds to the processing in step S714.

In step S702, an interrupt signal from the wireless power supply unit 224 allows the CPU 214 of the MFP 101 to detect the completion of the power supply time. If the CUP 214 detects the completion (YES in step S702), the CPU 214 proceeds to the processing in step S703. If the CPU 214 does not detect the completion (NO in step S702), the CPU 214 proceeds to the processing in step S704.

In step S704, the CPU 214 determines whether the CPU 214 receives an interruption request for power supply from the external device A via communication with the supply communication unit 222. If the CPU 214 receives an interruption request (YES in step S704), the CPU 214 performs processing in step S705. If the CPU 214 does not receive the interruption request (NO in step S704), the CPU 214 proceeds to the processing in step S702, and performs the processing until the power supply is terminated.

In step S705, the CPU 214 sets a power supply stop command to the wireless power supply unit 224 based on the interruption request for power supply. Thus, the CPU 214 terminates power supply from the wireless power supply unit 224.

When completing or terminating the power supply (YES in step S702), in step S703, the CPU 214 of the MFP 101 issues a notification of power supply completion to the external device via the power supply communication unit 222 to request the device information such as the status of the external device A. Here, the status is information that represents whether the external device A locates within the boundary of the power suppliable area 106, and is the information corresponds to the area of the data table (FIG. 3).

In step S713, the external device A transmits an interruption request and then in step S714, receives a notification of power supply completion from the MFP 101, followed by proceeding to the processing in step S715. In this way, the MFP 101 can appropriately terminate the power supply in response to the request from the external device A. Next, in step S715, the external device A transmits the device information of the external device A requested from the MFP 101, such as information about the status and the battery charging status of the external device A, to the MFP 101.

In step S706, the CPU 214 of the MFP 101 receives the device information of the external device A via the power supply communication unit 222. In step S707, the CPU 214 updates the data table based on the received device information. In other words, the CPU 214 writes the area and the battery charging status, which correspond to the device ID of the external device A, in the data table.

Here, the external device A determines the status corresponding to the area of the data table. For example, when the external device A locates in a position far from the MFP 101, the efficiency of wireless power supply may become inefficient and the ability of power supply from the MFP 101 to the external device A may become less than the required power. In this case, therefore, the external device A replies status "OUT" to the MFP 101 in step S706. On the other hand, when the MFP 101 performs power supply according to the required power of the external device A without any trouble, the external device A replies status "IN" to the MFP 101.

In step S708, the CPU 214 transmits a reception notification of the device information to the external device A. Consequently, the MFP 101 completes its processing in the power transfer period. Furthermore, in step S716, the external device A receives device information from the MFP 101 and completes the processing in the power transfer period.

Next, description will be made on the processing in step S605 in the transfer preparation period, where the CPU 214 refers to the data table to calculate the power supply time of the external device serving as a power supply target. Specifically, description will be made on allocation processing in which the power supply ability of the wireless power supply unit 224 is set to 1,000 mW/min, for example.

For example, description will be made on a case where the data table includes three external devices of device IDs 03, 02, and 05. In this case, the CPU 214 respectively allocates these device IDs to frames with reference to the data table (FIG. 3) as follows:

Frame 1: device ID 03, 100 mW/min, 20-second power supply;

Frame 2: device ID 02, 200 mW/min, 20-second power supply; and

Frame 3: device ID 05, 200 mW/min, 20-second power supply.

In this case, the total amount of power supplied to three external devices is 500 mW/min calculated from Equation 1.

$$100+200+200=500 \text{ (mW/min)} \quad \text{(Equation 1)}$$

The total amount of power (500 mW/min) is less than the power supply ability (1,000 mW/min) of the wireless power supply unit **224**.

Thus, the CPU **214** allocates the device IDs to the respective frames as described above, and then sets the power supply time of the device IDs 03, 02, and 05. Then, the CPU **214** performs processing on the frames in the order of frame 1, frame 2, frame 3, and frame 1 in a repetitive manner to supply power to the external devices. FIG. **9** is a schematic diagram illustrating the results of the above frame allocation. As illustrated in FIG. **9**, the CPU **214** continuously performs the respective frame processing.

Furthermore, the above frame processing takes 20 seconds including the association period, transfer preparation period, and power transfer period. However, the power transfer period per frame occupies 90% or more of one frame. Thus, as an alternative example, the CPU **214** may calculate the power supply time of the respective periods such that the power transfer period takes 20 seconds.

Furthermore, description will be made on a case where the data table includes three external devices of device IDs 03, 02, and 04. In this case, the CPU **214** respectively allocates these device IDs to frames as follows:

Frame 1: device ID 03, 100 mW/min, 20-second power supply;

Frame 2: device ID 02, 200 mW/min, 20-second power supply; and

Frame 3: device ID 04, 800 mW/min, 20-second power supply.

In this case, the total amount of power supplied to three external devices is 1,100 mW/min calculated from Equation 2.

$$100+200+800=1,100\ (\text{mW/min}) \qquad \text{(Equation 2)}$$

The total amount of power (1,100 mW/min) is more than the power supply ability (1,000 mW/min) of the wireless power supply unit **224**. Thus, one of the external devices should be out of the power supply targets. For example, the CPU **214** may select the device ID 03 as one out of the power supply targets. In this case, the CPU **214** allocates the remaining external device IDs to the respective frames and sets their power supply time as follows:

Frame 1: device ID 02, 200 mW/min, 30-second power supply; and

Frame 2: device ID 04, 800 mW/min, 30-second power supply.

If the user desires to target the external device of device ID 03, the user can set the power supply ability of the wireless power supply unit **224** to as high as 1,100 mW/min via the operation unit **211**. Thus, the external device of device ID 03 can be included in the power supply targets.

Furthermore, the user can set the power supply ability of the wireless power supply unit **224** to as low as 300 mW/min. Thus, the CPU **214** can prevent the wireless power supply unit **224** from supplying an excessive amount of power, thereby reducing power consumption.

In this case, the CPU **214** selects the external device of device ID 04 as one out of the power supply targets, and the CPU **214** respectively allocates the device IDs to frames and sets their power supply time as follows:

Frame 1: device ID 03, 100 mW/min, 30-second power supply; and

Frame 2: device ID 02, 200 mW/min, 30-second power supply.

In this case, the total amount of power supplied to two external devices is 300 mW/min calculated from Equation 3.

$$100+200=300\ (\text{mW/min}) \qquad \text{(Equation 3)}$$

In the above processing, when the external device out of the power supply targets is selected, the CPU **214** sets a Stop flag to the power supply flag corresponding to the selected external device in the data table.

Alternatively, the user may select the external device out of the power supply targets via the operation unit **211** to set power supply. In this case, the CPU **214** keeps the setting of the power supply ability of the wireless power supply unit **224** to 1,000 mW/m, while adjusting the frame allocation, for example, as follows:

Frame 1: device ID 03, 100 mW/min, 30-second power supply;

Frame 2: device ID 04, 800 mW/min, 30-second power supply;

Frame 3: device ID 02, 200 mW/min, 30-second power supply; and

Frame 4: device ID 04, 800 mW/min, 30-second power supply.

In other words, the CPU **214** sets the power supply of 2,000 mW per two minutes, and adjusts the frame allocation to prevent the power supply ability of the wireless power supply unit **224** from exceeding 1,000 mW/min.

Thus, the CPU **214** performs processing to always provide the data table with the most up-to-date data, while performing the frame allocation with reference to the data table.

Furthermore, the CPU **214** performs processing with reference to the data table to display on the operation unit **211** the information about power supply to each external device. FIG. **10** is a diagram illustrating the operation unit **211**. The operation unit **211** includes an operation screen **1001** and an options button **1002**. The operation screen **1001** is a liquid-crystal operation touch panel. For example, the user can operate the options button **1002** to change the operation screen **1001**. Thus, the user can perform various kinds of setting on the operation screen **1001**.

For example, when the user operates the options button **1002** to change the operation screen **1001**, the operation screen **1001** displays a display-setting button for power supply information (not illustrated). The display-setting button for power supply information is a button that allows the MFP **101** to receive the user's instruction for displaying the power supply information.

Description will be made below on processing for displaying the power supply information, by which the operation unit **211** displays the information about power supply to each external device. The user selects the display-setting button for power supply information from the operation unit **211** to cause the operation control unit **209** to transmit a request for displaying the power supply information to the CPU **214** via the bus **212**.

The CPU **214** reads out information required for displaying the information from the data table, and then prepares display data as illustrated in FIG. **11**. The display data includes device IDs registered in the data table. The display data further includes battery charging status, power supply status, a power supply area, a priority flag, and a cooperation flag, corresponding to each device ID.

As described above, the battery charging status is represented by a unit of percent (%). The power supply status corresponds to the power supply flag of the data table. "Supply" is displayed indicating that power is being supplied, and "Stop" is displayed indicating that power is not being supplied, as the power supply information.

The power supply area corresponds to the area of the data table. "IN" is displayed on a power supply area corresponding to the external device located inside the power suppliable area

106. "OUT" is displayed on a power supply area corresponding to the external device located outside the boundary of the power suppliable area **106**.

The priority flag corresponds to the priority flag of the data table. When the user sets an external device as one to which power is supplied preferentially, the priory flag of this external device indicates "Priority".

The cooperation flag corresponds to the cooperation flag of the data table. The cooperation flag indicates a state where the external device cooperates with the MFP **101**. For example, "Print" is displayed when the external device is performing a print job, and "Scan" is displayed when the external device is performing a scan job.

The CPU **214** transfers the prepared display data to the operation control unit **209** via the bus **212**, and then issues a display command. The operation control unit **209** displays the display data on the operation screen **1001** of the operation unit **211** in response to the display command.

FIG. **12** is a diagram illustrating an example of a display data screen displayed on the operation screen **1001**. A display data screen **1202** illustrated in FIG. **12** corresponds to the display data illustrated in FIG. **11**. The operation unit **211** displays the display data of FIG. **11** as illustrated in FIG. **12**.

The display data screen **1202** displays the states of the external device of device ID 01 such that the battery charging status is 50%, the power supply is in a "Stop" state, the external device is out of the power suppliable area **106**, and neither the priority flag nor the cooperation flag are present.

Furthermore, the display data screen **1202** displays the states of the external device of device ID 02 such that the battery charging status is 40%, the external device is located within the power suppliable area **106**, the power supply is in a "Supply" state, the priority flag is set, and the cooperation flag is not present.

Furthermore, the display data screen **1202** displays the states of the external device of device ID 04 such that the battery charging status is 80%, the external device is located within the power suppliable area **106**, the power supply is in a "Supply" state, the priority flag is not present. Furthermore, display data screen **1202** displays the state of the external device of device ID 04 as the cooperation flag "Print", thereby representing that this external device is in a state of being cooperated with the MFP **101**.

The user operates the operation screen **1001** of touch panel type to select a desired device ID and make various kinds of settings such as a priority flag setting. In addition, the user may operate the operation screen **1001** to make settings of the start of power supply, the stop of power supply, and the like for the external device located within the power suppliable area **106**. When the user changes the settings via the operation screen **1001**, a change instruction is transmitted to the CPU **214** via the operation control unit **209** and the bus **212**. Then, the CPU **214** controls the settings.

Furthermore, when the state of the external device satisfies conditions for changing the power supply ability, the CPU **214** displays on the operation screen **1001** the display data screen **1202** together with a power-supply ability changing key **1201**. Here, the power-supply ability changing key **1201** is a user interface that receives an instruction for changing the boundary of the power suppliable area **106**, that is, the power supply ability of the wireless power supply unit **224**. The conditions for changing the power supply ability will be described below.

Description will be made below on processing for optimizing the boundary of the power suppliable area **106** by changing the power supply ability of the wireless power supply unit **224**. The power supply ability of the wireless power supply unit **224** is set to a default value at the beginning. In addition, the operation unit **211** cannot receive the user's instruction for changing the power supply ability at this time. Thus, the operation unit **211** does not handle any processing for changing the power supply ability of the wireless power supply unit **224** in response to the change instruction from the user.

As described above, however, if the state of the external device satisfies conditions for changing the power supply ability, the operation unit **211** is able to receive the user's instruction for changing the power supply ability. Thus, the MFP **101** of the present exemplary embodiment can change the power supply ability in response to the user's change instruction.

Here, the conditions for changing the power supply ability are conditions of the external device. The CPU **214** determines whether the state of the external device satisfies the conditions for changing the power supply ability based on the information received by the MFP **101** from the external device in the power supply processing. More specifically, the MFP **101** predefines the following five conditions:

Condition 1: all devices are capable of only communication;

Condition 2: a device out of the power supply area is in cooperation with the MFP;

Condition 3: the number of the devices in the power supply area is larger than that of devices to which power can be supplied;

Condition 4: only one device to which power can be supplied is included in the power supply area; and

Condition 5: a device requires preferential power supply.

An example will be described below such that the number of the devices to which power can be supplied in Condition 2 above is five according to the present exemplary embodiment.

The CPU **214** determines whether the state of the external device satisfies any of the above conditions based on the information received from the external device in the power supply processing. If the state satisfies any of these conditions, the CPU **214** displays the power-supply ability changing key **1201**. If the state does not satisfy any condition, the CPU **214** does not display the power-supply ability changing key **1201**.

First, description will be made on the case in which the state of the external device does not satisfy the conditions for changing the power supply ability. For example, based on the data table, the CPU **214** prepares display data as illustrated in FIG. **13**. In this case, the CPU **214** refers to the data table and determines that the state of the external device does not satisfy the conditions for changing the power supply ability. Thus, as illustrated in FIG. **14**, the operation screen **1001** displays only a display data screen **1203** corresponding to the display data in FIG. **13**, and does not display the power-supply ability changing key **1201**.

Next, description will be made on the case in which the state of the external device satisfies the conditions for changing the power supply ability. For example, based on the data table, the CPU **214** prepares display data as illustrated in FIG. **15**. In this case, the CPU **214** refers to the data table and determines that the state of the external device satisfies Condition 1. Thus, as illustrated in FIG. **16**, the operation screen **1001** displays a display data screen **1204** corresponding to the display data in FIG. **15**. The operation screen **1001** also displays the power-supply ability changing key **1201**. The user operates the power-supply ability changing key **1201** to change the power supply ability of the wireless power supply unit **224**, thereby changing the boundary of the power suppliable area **106**. In the example illustrated in FIG. **15**, for example, the state of the external device satisfies Condition 1.

Thus, the power suppliable area **106** can be extended by increasing the power supply ability of the wireless power supply unit **224**. Thus, the MFP **101** becomes possible to supply power to an external device located in a position far from the MFP **101**. Furthermore, the power supply ability changed by the power-supply ability changing key **1201** can be changed to a default value when the external device serving as a power supply target moves out of the changed power suppliable area **106**.

FIG. **17** is a flow chart illustrating display processing for displaying the display data screen. In step **S1701**, the CPU **214** determines whether the user selects a display button for power supply information from the operation unit **211**. If the user selects the display button for power supply information (YES in step **S1701**), the CPU **214** starts processing for generating a display data screen, and then proceeds to processing in step **S1702**.

In step **S1702**, the CPU **214** prepares display data based on the data table. Next, in step **S1703**, the CPU **214** determines whether the state of the external device satisfies the conditions for changing the power supply ability. If the state satisfies the conditions for changing the power supply ability (YES in step **S1703**), the CPU **214** proceeds to processing in step **S1704**. If the state does not satisfy the conditions for changing the power supply ability (NO in step **S1703**), the CPU **214** proceeds to step **S1705**.

In step **S1704**, the CPU **214** displays a button for changing power supply ability on the operation screen **1001**. Next, in step **S1705**, the CPU **214** displays the display data screen prepared in step **S1702** on the operation screen **1001**. Here, the display data screen displays an external device allowed to receive power from the MFP **101**.

In other words, step **S1705** represents an example of display control processing. The display screen, which displays the button for changing power supply ability in step **S1704**, and displays the display data screen in step **S1705**, is an example of the changing screen.

In step **S1706**, the CPU **214** determines whether the user operates another operation button in the operation unit **211**. If the CPU **214** determines that the user operates another operation button (YES in step **S1706**), the CPU **214** proceeds to processing in step **S1707**. In step **S1707**, if the CPU **214** determines that the user performs another operation other than predetermined operations (YES in step **S1707**), the CPU **214** completes the display processing.

In step **S1707**, the CPU **214** determines that the user performs a predetermined operation (NO in step **S1707**), the processing proceeds to step **S1708**. In step **S1708**, the CPU **214** executes processing corresponding to the selected operation button. The processing corresponding to the operation button includes setting or canceling the priority flag for the desired external device, and the start and stop of power supply to the desired external device. Furthermore, when the operation screen **1001** displays the button for changing power supply ability, processing corresponding to the operation button includes processing for changing the power supply ability.

For example, the user selects and inputs a desired external device, and then inputs an instruction for starting power supply to the selected external device. In this case, in step **S1708**, the CPU **214** receives the input for selecting the external device as a power supply target (input reception processing). Then, the CPU **214** identifies the external device selected by the user as a power supply target (target device for power supply) (processing for identifying a target device for power supply).

Furthermore, for example, the user performs an input for selecting a desired external device, and inputs an instruction for terminating power supply to the selected external device. In this case, in step **S1708**, the CPU **214** receives the input for selecting the external device as a power supply target. Then, the CPU **214** deletes the selected external device from the external device as a power supply target (target device for power supply) (processing for identifying a target device for power supply).

Furthermore, for example, in a state of displaying the button for changing power supply ability, the user operates the button for changing power supply ability to specify the value of power supply ability after being changed. In this case, in step **S1708**, the CPU **214** receives the value of power supply ability after the change input from the user, and changes the power supply ability of the wireless power supply unit **224** to the power supply ability after the change input from the user (processing for changing the amount of power). Here, the power supply ability of the wireless power supply unit **224** is a value of the amount of power at the time of power supply. The processing in step **S1707** is an example of the input reception processing, and the processing in step **S1708** is an example of the processing for changing the amount of power.

Subsequently, in step **S1709**, the CPU **214** updates the data table based on the results of the executed processing, followed by proceeding to step **S1703**.

As described above, the MFP **101** of the present exemplary embodiment displays a display data screen to receive the user's selection of an external device requesting power supply and identify the external device as a power supply target based on the user's selection. Furthermore, the MFP **101** receives an instruction for changing the power supply ability and changes the power supply ability based on the change instruction. Therefore, the MFP **101** can perform power supply upon the user's request. Furthermore, the MFP **101** can be prevented from performing power supply not intended by the user and consuming unnecessary power due to inefficient power supply.

The MFP **101** of the present exemplary embodiment displays on the operation screen **1001** a display data screen indicating a power receptive device, and allows the user to select a target device for power supply on the display data screen. However, the MFP **101** may not display the power receptive device on the operation screen **1001**. For example, in some cases, the user desires the power supply to the external device while in other cases, the user does not desire the power supply to the external device. In this case, via the operation unit **211**, the user may input an instruction for starting or stopping the power supply to the external device provided as a desired target without reference to the display data screen. In this case, the CPU **214** may identify the target device for power supply based on the input to the operation unit **211**.

Furthermore, as another example, when the state of the external device satisfies the conditions for changing the power supply ability, the CPU **214** may automatically change the power supply ability without receiving an instruction from the user. For example, when the state of the external device satisfies Condition 1, the CPU **214** may increase the amount of power to a predetermined level.

Embodiments of the present invention can also be realized by a computer of a system or apparatus that reads out and executes computer executable instructions recorded on a storage medium (e.g., non-transitory computer-readable storage medium) to perform the functions of one or more of the above-described embodiment(s) of the present invention, and by a method performed by the computer of the system or

apparatus by, for example, reading out and executing the computer executable instructions from the storage medium to perform the functions of one or more of the above-described embodiment(s). The computer may comprise one or more of a central processing unit (CPU), micro processing unit (MPU), or other circuitry, and may include a network of separate computers or separate computer processors. The computer executable instructions may be provided to the computer, for example, from a network or the storage medium. The storage medium may include, for example, one or more of a hard disk, a random-access memory (RAM), a read only memory (ROM), a storage of distributed computing systems, an optical disk (such as a compact disc (CD), digital versatile disc (DVD), or Blu-ray Disc (BD)™), a flash memory device, a memory card, and the like.

While the present invention has been described with reference to exemplary embodiments, it is to be understood that the invention is not limited to the disclosed exemplary embodiments. The scope of the following claims is to be accorded the broadest interpretation so as to encompass all such modifications and equivalent structures and functions.

This application claims the benefit of Japanese Patent Application No. 2013-003525 filed Jan. 11, 2013, which is hereby incorporated by reference herein in its entirety.

What is claimed is:

1. A power supply apparatus comprising:

a wireless power supply unit configured to wirelessly supply power to a device located within a power supply area;

an acquiring unit configured to acquire device information from a device located within a communication area; and

a display unit configured to display, based on the device information acquired by the acquiring unit, a status screen indicating a status of the device located within the communication area,

wherein a changing object for changing the power supply area is displayed on the status screen.

2. The power supply apparatus according to claim **1**, further comprising:

a determining unit configured to determine whether to display the changing object on the status screen,

wherein if the determining unit determines to display the changing object on the status screen, the display unit displays the changing object on the status screen, and if the determining unit determines not to display the changing object on the status screen, the display unit does not display the changing object on the status screen.

3. The power supply apparatus according to claim **1**, wherein the wireless power supply unit wirelessly supplies power to a plurality of devices located within the power supply area.

4. The power supply apparatus according to claim **1**, wherein the acquiring unit acquires a plurality of pieces of device information from a plurality of devices located within the communication area, and

wherein the display unit displays statuses of the plurality of devices on the status screen.

5. The power supply apparatus according to claim **1**, wherein a battery charging status of the device located within the communication area is displayed on the status screen.

6. The power supply apparatus according to claim **1**, wherein the communication area is larger than the power supply area.

7. The power supply apparatus according to claim **1**, wherein the power supply apparatus is a printing apparatus capable of performing printing.

8. A method comprising:

wirelessly supplying power to a device located within a power supply area;

acquiring device information from a device located within a communication area; and

displaying, based on the device information acquired by the acquiring unit, a status screen indicating a status of the device located within the communication area,

wherein a changing object for changing the power supply area is displayed on the status screen.

9. A non-transitory computer-readable storage medium which stores instructions that when executed cause a processor to perform processes relating to supplying power, such processes comprising:

wirelessly supplying power to a device located within a power supply area;

acquiring device information from a device located within a communication area; and

displaying, based on the device information acquired by the acquiring unit, a status screen indicating a status of the device located within the communication area,

wherein a changing object for changing the power supply area is displayed on the status screen.

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